**COST ANALYSIS**

# Washington Department of Ecology Year 2001 Minimum Requirements for Stormwater Management in Western Washington


**Washington State Department of Transportation**

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**Table 1. Summary of Costs to Comply with the Minimum Requirements for New Development**

| Type of Development | Low Cost Per Acre of Development | High Cost Per Acre of Development |
|---|---|---|
| 10-acre single-family residential (5.5 dwelling units per acre) | $23,000 | $24,000 |
| 1-acre commercial | $280,000 | $570,000 |
| 10-acre commercial | $32,000 | $86,000 |

# Comparisons to Costs Associated With the Former Minimum Requirements

A similar cost analysis was performed for the 1992 *Stormwater Management Manual for the Puget Sound Basin*. Although the cost estimates for the current analysis include some items that were not incorporated in the 1993 analysis, those previous cost estimates provide a basis for a general evaluation of the effects of the updated stormwater management requirements on total implementation costs. The cost totals for the site examples with type C soils (i.e., no infiltration) in the 1993 report were updated to the year 2001 by using the same unit prices, as well as the same assumptions for engineering and permitting costs (30 percent) and taxes (8.8 percent), as applied in the present analysis. Thus, the 1993 cost analysis material quantities were used in combination with cost assumptions that parallel the present analysis as much as possible. Several minor cost items from the 1993 analysis were not incorporated in the cost tables for this report, and therefore a different approach was used to update those items to the year 2001. An adjustment factor of 30 percent was used to update these miscellaneous cost items, based on construction cost inflation observed in the Puget Sound area through the year 2000 and extrapolation to this year (ENR 2000).

The cost totals for the site examples with type B soils from the 1993 report were disregarded in the present analysis. Instead, new quantity and cost estimates were prepared for those site examples assuming type A soils, assuming the same types of permanent stormwater site plan BMPs as assumed in the present analysis, and incorporating the year 1992 design requirements to determine wetpond and infiltration basin sizes under the older requirements. The revised stormwater facility quantity estimates were then coupled with the year 2001 unit prices used for the present analysis to estimate comparable costs based on the previous design manual requirements. Appendix C presents a brief overview of the re-analysis performed for the 1993 cost examples with infiltration.

The updated cost totals for the 1993 examples, excluding land costs, are shown in Table 2 below in comparison to the cost totals from the present analysis.

This comparison illustrates some important points. If most or all of the site runoff can be infiltrated, and underground facilities are not needed in that process, the costs of managing stormwater are comparable or slightly lower in the present analysis. That is mostly due to the

effect that rooftop downspout infiltration has on reduction of wetpond and infiltration basin sizes.

**Table 2. Comparison of Implementation Costs Under the Year 1992 and Year 2001 Stormwater Management Requirements.**

| Development Scenario | Total Implementation Costs Based on 1992 Standards | Total Implementation Costs Based on 2001 Standards | Difference in Cost |
|---|---|---|---|
| 10-acre residential with infiltration | $280,000 | $240,000 | - 14% |
| 10-acre residential without infiltration | $214,000 | $230,000 | + 7% |
| 1-acre commercial with infiltration | $84,000[a] | $280,000 | + 233% |
| 1-acre commercial without infiltration | $41,000[a] | $570,000 | + 1290% |
| 10-acre commercial with infiltration | $340,000 | $320,000 | - 6% |
| 10-acre commercial without infiltration | $260,000 | $490,000[b] | + 88% |

[a] The 1993 study assumed that the stormwater management facilities would be placed above ground rather than in vaults, and that greatly affects implementation cost.

[b] Cost associated with open-air sand filter rather than more expensive option with buried sand filter vault

The new requirements for enhanced treatment of runoff (sites 2 and 3) and flow control to match pre-developed flow durations as well as peak rates (for the scenarios with type C soils on all three sites) result in significantly greater storage volumes in the stormwater management ponds and vaults compared to the 1992 requirements. If a site cannot use an infiltration system for flow disposal, the cost of managing the stormwater rises significantly because of the required detention volume and the required enhanced treatment system (at non-residential sites). The detention storage volumes needed to satisfy the new flow duration control requirements, in particular, are much higher, on the order of twice the detention volumes previously needed for peak flow control only. In addition, the wetpool treatment storage volumes needed have increased slightly compared to the 1992 requirements because of a greater design storm precipitation depth. The increase in storage volumes needed on all of the example sites has a direct effect on compliance costs. When these facilities are placed in buried vaults, that cost increase becomes more pronounced.

The new requirements for onsite stormwater management using downspout infiltration systems and flow dispersion systems (among other techniques) also have an effect on overall costs. In the 10-acre residential development example with type A soils these facilities are relatively inexpensive due to the ability to use the "alternative" infiltration trench design. However, in the 1- and 10-acre commercial site examples with type A soils these systems are relatively expensive due to the need for inlet catch basins, perforated pipe, and soil backfill. Even with the greater relative cost for downspout infiltration at the commercial sites, the savings in cost that result from smaller pretreatment systems and infiltration systems (roughly 20 percent lower cost) is well worth the investment in downspout infiltration. In type C soils it was assumed that downspout infiltration systems would not be provided at any of the sites (inexpensive downspout dispersion systems were assumed), resulting in a greater volume of runoff flowing to the stormwater treatment and detention facilities. This analysis did not attempt to incorporate